

CompSci 101

Turtles, for loop, accumulation, range

Susan Rodger
February 9, 2023

create a new empty string `answer`
for each character `ch` in the `phrase`
 if `ch` is not a vowel
 add `ch` to the end of `answer`
`answer` is the result

2/9/23

Compsci 101, Spring 2023 1

H is for ...



- **HTTP**
 - A Protocol we use every day, and HTTPS
- **Hello World**
 - The quintessential first program: 40 years ago!
<http://helloworldcollection.de/>
- **Hack**
 - Hacker, Hacktivism, Hack Duke
- **Hashing**
 - How Dictionaries work

2/9/23

Compsci 101, Spring 2023

2

Brian Fox



- See Wikipedia: <http://bit.ly/brianfox2018>
 - Bash Shell, Stallman, Wells Fargo, more
- See LifeHacker: <http://bit.ly/brianfox-hack>
 - Learned Logo at 8, wrote it at 21 for Apple!
 - Open Voting

There's nothing that I am better at than everyone else, except being me. There's no secret to being me. Follow your interests and work hard at them. Then you will play bass better, program better, cook better, ride motorcycles better, or anything else that you really want to do.

2/9/23

Compsci 101, Spring 2023 3

Announcements

- **Assignment 2 out – Quiz due 2/14, program 2/16**
- **APT-2 due tonight!**
- **Lab 4 Friday**
 - Complete prelab before going to lab
- **Reading and Sakai quizzes for next week up today**
- **Exam 1**
 - Do not discuss until it is handed back!

2/9/23

Compsci 101, Spring 2023 4

PFTD

- Import a file
- String and List Functions
- Turtles
- For loop/Accumulation

2/9/23

Compsci 101, Spring 2023 5

Main: `if __name__ == '__main__':`

- Main – where Python starts and ends in some file
- Consider file `Food.py`

```
def makeSandwich(food):  
    print("Making the sandwich", food)  
  
if __name__ == '__main__':  
    makeSandwich('peanut butter and jelly')
```

2/9/23

Compsci 101, Spring 2023 6

Main vs. Import

- Import – another file with useful code (functions)
 - Ignores `if __name__ == '__main__'` in the other file

- `Food.py`

```
def makeSandwich(food):  
    print("Making the sandwich", food)  
  
if __name__ == '__main__':  
    makeSandwich('peanut butter and jelly')
```

- `FoodFriend.py`

```
import Food  
  
if __name__ == '__main__':  
    Food.makeSandwich("bacon, lettuce, and tomato")
```

2/9/23

Compsci 101, Spring 2023 8

Run `FoodFriend.py`

- `FoodFriend.py`

```
import Food  
  
if __name__ == '__main__':  
    Food.makeSandwich("bacon, lettuce, and tomato")
```

2/9/23

Compsci 101, Spring 2023 10

Main vs. Import

- Run main in Food.py
- Run main in FoodFriend.py

Food2.py – Bad Code!

- Food2.py – Modification of Food.py

```
def makeSandwich(food):  
    print("Making the sandwich", food)  
  
makeSandwich('hummus and sprouts')  
  
if __name__ == '__main__':  
    makeSandwich('peanut butter and jelly')
```

More String and List Methods

String	
.find(s)	index of first occurrence of s
.rfind(s)	index of last occurrence of s (from Right)
.upper()/ .lower()	uppercase/lowercase version of string
.strip()	remove leading/trailing whitespace
.count(s)	number of times see s in string
.startswith(s)	bool of whether the string begins with s
.endswith(s)	bool of whether the string ends with s

List	
sum(lst)	sum of the elements in lst
max(lst)	maximum value of lst
min(lst)	minimum value of lst
.append(elm)	Mutates the list by adding elm to the end of the list
.count(elm)	Number of times see elm in the list

Some String Methods

```
str = 'ghosts'  
x = str.find('s')  
x = str.rfind('s')  
x = str.upper()  
x = str.count('s')  
x = str.startswith('gh')  
x = str.endswith('s')  
x = str.endswith('t')
```

Some List Methods

```
lst = [5, 2, 4, 5, 5]      lst is [5, 2, 4, 5, 5]
x = max(lst)
x = min(lst)
x = sum(lst)
x = lst.count(5)
lst.append(7)
x = lst.append(3)
```

Three ways to use functions with List

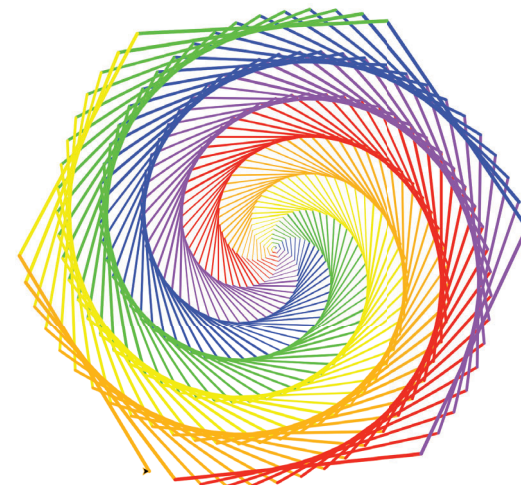
- `x = max(lst)`
 - `lst` is parameter to the `max` function that has a return value
- `x = lst.count(5)`
 - `lst` has its own functions that can be applied to a list
- `lst.append(7)`
 - mutates/changes `lst`, no return value

```
sort(self, key=None, reverse=False)
pop(self, index)
copy(self)
count(self, value)
index(self, value, start, stop)
append(self, object)
clear(self)
extend(self, iterable)
insert(self, index, object)
remove(self, value)
reverse(self)
add(self, value)
```

lst.

WOTO-1 – Import, Strings and Lists
<http://bit.ly/10123s-0209-1>

Run Turtle, Run



Turtle Programming

- **Must:**
 - Import turtle module
 - Create window/Screen
 - Last thing - exit on click
 - Create turtles to use, name/type/value
- **Review Turtle commands and concepts**
 - http://bit.ly/turtle_tutorial for more, and book
- **See ColorMyWorld.py, and Spiro.py for some ideas**
 - Color, Position, Leaving Turtle where started
 - Many more commands than this



Put yourself in the turtle t...

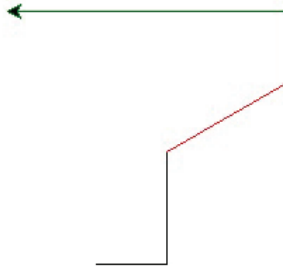
```
t.forward(50)      # turtle moves forward
                  # drawing a line
t.left(90)        # turtle turns to its left
t.pencolor("blue") # change pen color
t.forward(100)    # turtle moves forward
                  # drawing line, new color
```

```
import turtle

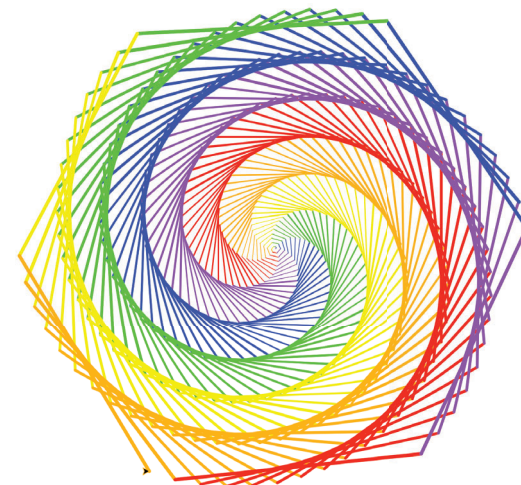
def drawPicture(turt):
    t.forward(50)
    t.left(90)
    t.forward(80)
    t.pencolor('red')
    t.right(60)
    t.forward(100)
    t.pencolor('green')
    t.left(60)
    t.forward(50)
    t.left(90)
    t.forward(200)

if __name__ == '__main__':
    win = turtle.Screen()
    t = turtle.Turtle()
    drawPicture(t)
    win.exitonclick()
```

Example:
simple.py



Run Turtle, Run



What are key concepts in Spiro.py?

```
8 import turtle
9
10 def draw(turt):
11     colors = ['red', 'purple', 'blue', 'green', 'yellow', 'orange']
12     turt.speed(0)
13     for x in range(360):
14         turt.pencolor(colors[x % 6])
15         turt.width(x/100 + 1)
16         turt.forward(x)
17         turt.left(59)
18
19 if __name__ == '__main__':
20     win = turtle.Screen()
21     t = turtle.Turtle()
22     draw(t)
23     win.exitonclick()
```

2/9/23

Compsci 101, Spring 2023 45

Turtle Concepts

- **Create a screen so you can ..**
 - Exit On Click
 - Some other Screen Functions
- **Create a turtle so you can ...**
 - Move and draw using the turtle
- **Drawing Concepts**
 - Pen [up and down]
 - Fill
 - Color
 - Position

2/9/23

Compsci 101, Spring 2023 50

Useful turtle functions

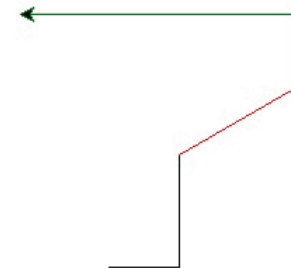
- **forward(n)/backward(n)** – move turtle n pixels
- **left(n)/right(n)** – turn turtle n degrees
- **pendown()/penup()** – whether actually drawing
- **setposition(x, y)** – puts turtle in this (x,y) coordinate (a.k.a. goto, setpos)
- **sethead(n)** – points turtle in this direction (n=0 is east)
- **Many more in documentation!**
 - <https://docs.python.org/3/library/turtle.html>

2/9/23

Compsci 101, Spring 2023 48

WOTO-2 - Turtles

<http://bit.ly/10123s-0209-2>



2/9/23

Compsci 101, Spring 2023 51

Looping over Sequences

- **Let's explore this:**
 - Given a sentence:
 - "Duke Computer Science is so much fun!"
 - How do we create this sentence?
 - "Dk Cmptr Scnc s s mch fn!"
 - Input is sentence. Output has vowels removed

2/9/23

Compsci 101, Spring 2023 53

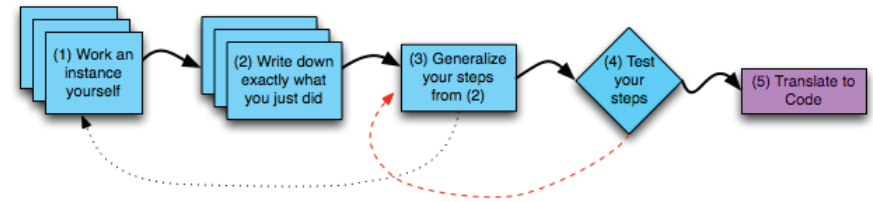
What did we do?

- **"Went through character sequence and removed the vowels."**
 - Not precise enough, what does "removed the vowels" mean? In Python?

2/9/23

Compsci 101, Spring 2023 55

Designing Solution



1. **Work an instance: Go Duke -> G Dk**
2. **What did we do?**
 - a. Paper and pencil, write it down!
3. **Generalize**
4. **Test: "Computer" -> "Cmptr"?**

2/9/23

Compsci 101, Spring 2023 54

Step 5: Translate to Code

- **Which function do we implement first?**
 - Translate sentence?
 - Is a vowel?
 - Reasons to prefer one to the other?
- **How do we verify that our function is correct?**
 - Reproducible testing not detailed here
 - Testing is really, really important

2/9/23

Compsci 101, Spring 2023 60

WOTO-3

<http://bit.ly/10123s-0209-3>

- Is it a vowel?

Accumulator Pattern: NoVowels

- “For each character, if it’s not a vowel add it to the output string”
- **Accumulator pattern: change a variable in a loop**
 - Accumulate a value while iterating through loop